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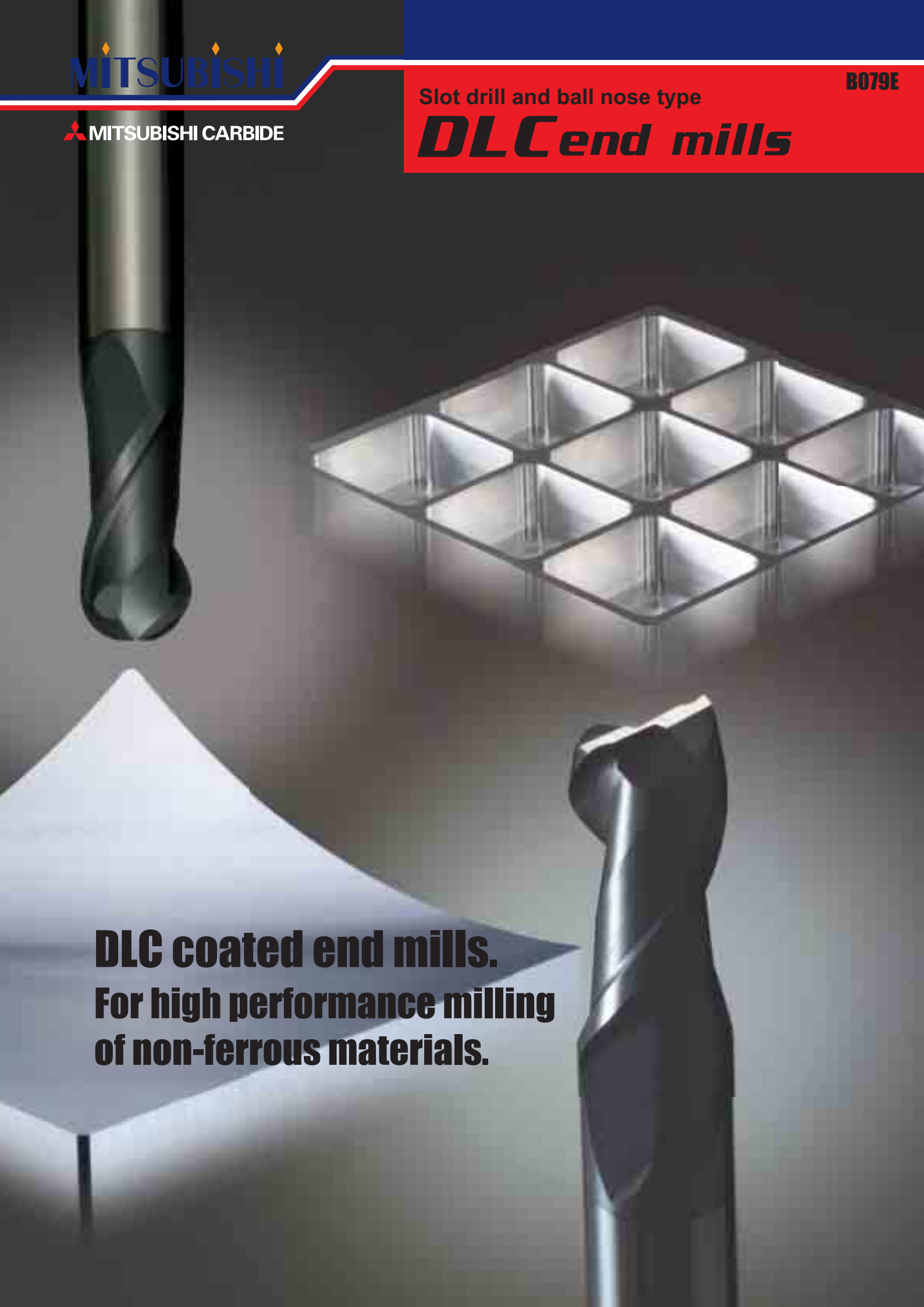
B079E

Slot drill and ball nose type

DLC end mills



DLC coated end mills.

For high performance milling of non-ferrous materials.

DLC Coated End Mill

DLC-2MA

Slot drill, Medium cut length, 2 flute

Features

DLC coated end mills for non-ferrous materials.

For high performance milling of non-ferrous materials such as Al-alloy, GFRP, CFRP, Copper-alloy and graphite.

New DLC coating.
A diamond film hardness with high adhesion strength.

Adhesion to the substrate used to be the weak point of DLC type coatings. Mitsubishi Materials original DLC coating has achieved a superior level of adhesion for longer tool life.(Co-developed with NAGATA SEIKI CO., LTD.).

High performance geometry and substrate

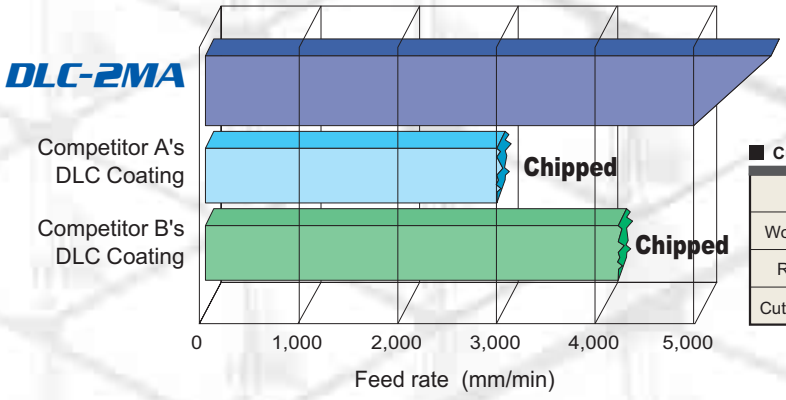
Designed using the most suitable carbide grade and flute geometry for non-ferrous materials and gives a high performance tool with good chip disposability and long tool life.

Close to Diamond hardness

Characteristics of DLC coating

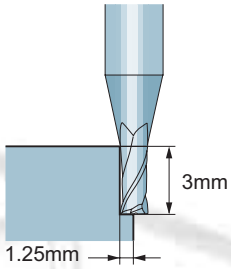
	DLC	Competitor's DLC	Diamond	TiN
Hardness (HV)	6,000–7,000	1,000–7,000	7,000–10,000	2,000
Wear Coefficient	0.1	0.1	0.4	0.4

Machining example



Cutting conditions

End mill	DLC-2MA ø3
Work material	AC4C-T6
Revolution	20,000min^{-1}(188m/min)
Cutting method	Climb cut, Air blow



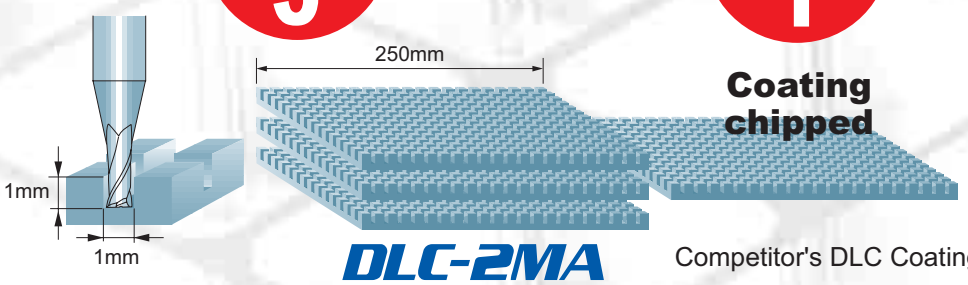
Performance report (1)

Al-alloy

Tool life x 3
compared to competitor

Cutting conditions

End mill	DLC-2MA ø1
Work material	A5052
Revolution	10,000min^{-1}(31m/min)
Feed rate	150mm/min
Cutting method	Slotting, Oil coolant



DLC Coated End Mill

DLC-2MB

Ball nose, Medium cut length, 2 flute

Features

DLC range

DLC coated ball nose slot drill with work material anti-adhesion properties, for high performance milling of non-ferrous materials.

Large range of sizes available

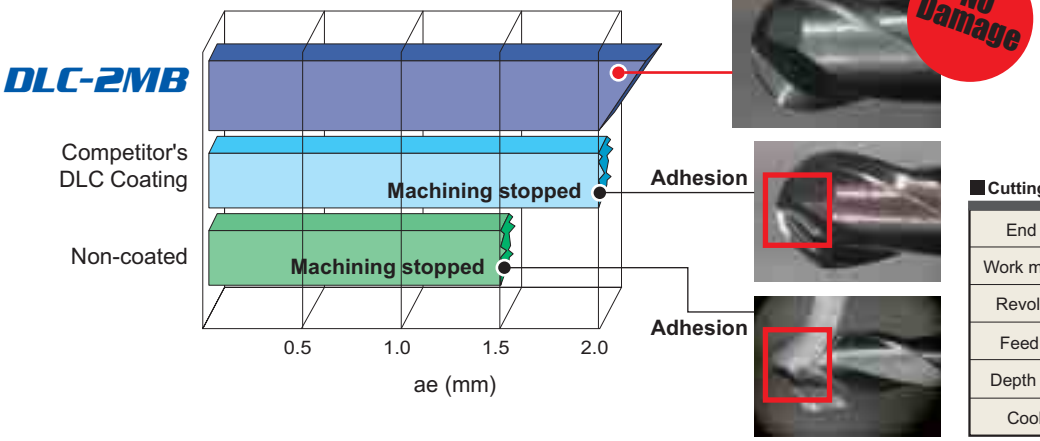
19 sizes in total, for a wide application area.

New DLC coating.
A diamond film hardness with high adhesion strength.

Adhesion to the substrate used to be the weak point of DLC type coatings. Mitsubishi Materials original DLC coating has achieved a superior level of adhesion for longer tool life.(Co-developed with NAGATA SEIKI CO., LTD.).

Machining Example

Anti-adhesion test



Cutting conditions

End mill	DLC-2MB R3
Work material	A5052
Revolution	20,000min^{-1}
Feed rate	6,000mm/min (0.15mm/tooth)
Depth of cut	ap 2mm
Coolant	Air blow

Performance Report (1)

Machining of Al-alloy (A5052)

After 6 hours machining,

No Damage.

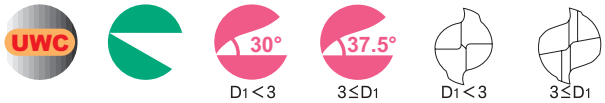
Cutting conditions

End mill	DLC-2MB R5
Work material	A5052
Revolution	12,000min^{-1}
Feed rate	2,200mm/min (0.09mm/tooth)
Depth of cut	ap 0.2mm pf 0.2mm
Coolant	Emulsion

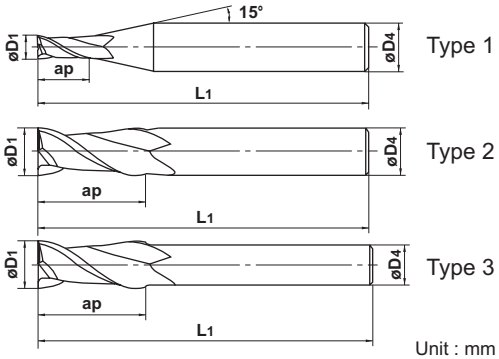
DLC-2MA

Slot drill, Medium cut length, 2 flute

D1≤12 -0.020
12<D1 -0.030



● DLC coating for high performance milling of non-ferrous materials.



Unit : mm

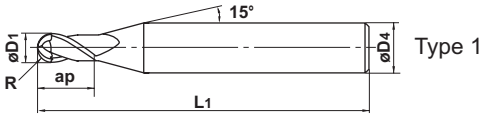
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DLC2MAD0100	1	2.5	40	4	2	●	1
DLC2MAD0150	1.5	4	40	4	2	●	1
DLC2MAD0200	2	6	40	4	2	●	1
DLC2MAD0250	2.5	8	40	4	2	●	1
DLC2MAD0300	3	8	45	6	2	●	1
DLC2MAD0400	4	11	45	6	2	●	1
DLC2MAD0500	5	13	50	6	2	●	1
DLC2MAD0600	6	13	50	6	2	●	2
DLC2MAD0800	8	19	60	8	2	●	2
DLC2MAD1000	10	22	70	10	2	●	2
DLC2MAD1200	12	26	75	12	2	●	2
DLC2MAD1400	14	26	75	12	2	●	3
DLC2MAD1500	15	30	80	16	2	●	1
DLC2MAD1600	16	32	90	16	2	●	2
DLC2MAD1800	18	32	90	16	2	●	3
DLC2MAD2000	20	38	100	20	2	●	2

● : Inventory maintained.

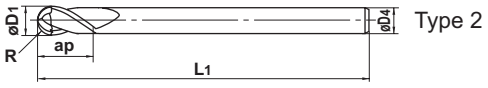
DLC-2MB

Ball nose end mill, Medium cut length, 2 flute

R≤6	±0.01
6<R	±0.02
D1≤6	0 – -0.020
6<D1	0 – -0.030



Type 1



Type 2

● DLC coating for high performance milling of non-ferrous materials.

Unit : mm

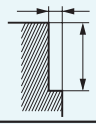
Order Number	Radius of ball nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DLC2MBR0010	0.1	0.2	0.4	40	4	2	●	1
R0015	0.15	0.3	0.6	40	4	2	●	1
R0020	0.2	0.4	0.8	40	4	2	●	1
R0025	0.25	0.5	1	40	4	2	●	1
R0030	0.3	0.6	1.2	40	4	2	●	1
R0040	0.4	0.8	1.6	40	4	2	●	1
R0050	0.5	1	2.5	40	4	2	●	1
R0075	0.75	1.5	4	40	4	2	●	1
R0100	1	2	6	60	6	2	●	1
R0125	1.25	2.5	6	60	6	2	●	1
R0150	1.5	3	8	70	6	2	●	1
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0400	4	8	14	90	8	2	●	2
R0500	5	10	18	100	10	2	●	2
R0600	6	12	22	110	12	2	●	2
R0800	8	16	30	140	16	2	●	2
R1000	10	20	38	160	20	2	●	2

● : Inventory maintained.

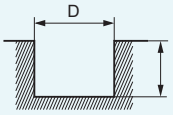
DLC-2MA

Slot drill, Medium cut length, 2 flute

Side milling

Work material	Aluminum alloy A7075		Aluminum cast AC4B	
Cutting speed	300m/min		240m/min	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40,000	600	40,000	460
2	40,000	1,100	38,000	850
3	32,000	1,400	25,000	950
4	24,000	1,500	19,000	1,000
5	19,000	1,600	15,000	1,000
6	16,000	1,900	13,000	1,100
8	12,000	1,900	9,500	1,200
10	9,500	1,900	7,600	1,200
12	8,000	1,900	6,400	1,200
16	6,000	1,900	4,800	1,200
20	4,800	1,500	3,800	1,000
Depth of cut	≤0.2D (D< φ3) ≤0.5D (D≥ φ3)  ≤1D D:Dia.			

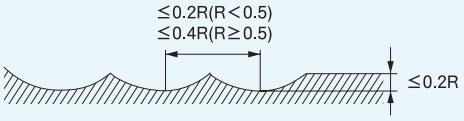
Slotting

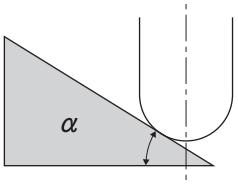
Work material	Aluminum alloy A7075		Aluminum cast AC4B	
Cutting speed	240m/min		200m/min	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40,000	460	40,000	350
2	38,000	850	32,000	550
3	25,000	950	21,000	600
4	19,000	1,000	16,000	650
5	15,000	1,000	13,000	700
6	13,000	1,100	11,000	750
8	9,500	1,200	8,000	800
10	7,600	1,200	6,400	800
12	6,400	1,200	5,300	800
16	4,800	1,000	4,000	720
20	3,800	970	3,200	660
Depth of cut	D  ≤1D (MAX. 12mm) D:Dia.			

1) If the rigidity of the machine or the work material installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) For milling of GFRP, please reduce the revolution and feed rate to 50% of the table figure (Al-alloy).
   Please adjust the depth of cut according to the quality of the GFRP. (GFRP=Glass Fibre Reinforced Plastic)
4) Water-soluble cutting fluid is recommended.
5) Climb cutting is recommended for side milling.

DLC-2MB

Ball Nose, Medium cut length, 2 flute.

Work material	Aluminium alloy A7075				Cast aluminium AC4B			
R (mm)	$\alpha \leq 15°$		$\alpha > 15°$		$\alpha \leq 15°$		$\alpha > 15°$	
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 0.1	40,000	350	40,000	260	40,000	280	40,000	210
R 0.15	40,000	480	40,000	360	40,000	380	40,000	290
R 0.2	40,000	600	40,000	450	40,000	480	40,000	360
R 0.25	40,000	800	40,000	600	40,000	640	40,000	480
R 0.3	40,000	1,000	40,000	750	40,000	800	40,000	600
R 0.4	40,000	1,500	40,000	1,100	40,000	1,200	40,000	880
R 0.5	40,000	2,000	40,000	1,500	40,000	1,600	40,000	1,200
R 0.75	40,000	2,200	40,000	1,600	40,000	1,800	40,000	1,300
R 1	40,000	2,800	40,000	2,200	40,000	2,200	32,000	1,400
R 1.25	40,000	3,200	38,000	2,200	32,000	2,000	30,000	1,400
R 1.5	40,000	4,000	32,000	2,600	32,000	2,600	26,000	1,700
R 2	30,000	4,200	24,000	2,800	24,000	2,700	19,000	1,800
R 2.5	24,000	4,400	19,000	2,800	19,000	2,800	15,000	1,800
R 3	20,000	4,000	16,000	2,800	16,000	2,600	13,000	1,800
R 4	15,000	3,600	12,000	2,400	12,000	2,300	9,600	1,500
R 5	12,000	3,600	9,500	2,000	9,600	2,300	7,600	1,300
R 6	10,000	3,200	8,000	2,200	8,000	2,000	6,400	1,400
R 8	7,500	2,800	6,000	1,800	6,000	1,800	4,800	1,200
R10	6,000	2,500	4,800	1,600	4,800	1,600	3,800	1,000
Depth of cut	 R:Radius							



1) α is the inclination of the machined surface.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
3) If the depth of cut is shallow, the revolution and feed rate can be increased.
4) When milling GFRP, please reduce the revolution and feed rate to 50% of the table figure of aluminium alloy.
   Please adjust the depth of cut according to the quality of the GFRP. (GFRP=Glass Fibre Reinforced Plastic)
5) Water-soluble cutting fluid is recommended.

DLC-2MA Performance report (2)

GFRP (Glass Fibre Reinforced Plastic)

High efficiency milling

DLC-2MA

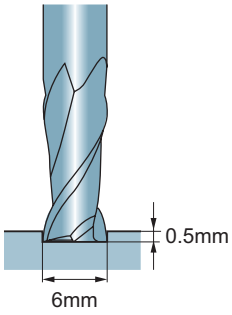
Number of work pieces **12**

Cutting length 1,064m

(Ti,Al)N Coating

Number of work pieces **3**

Cutting length 266m



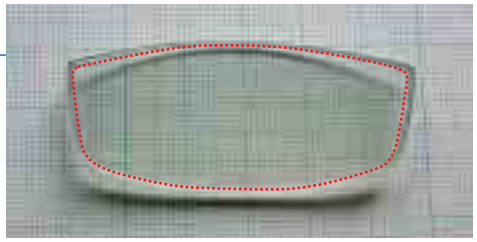
Cutting conditions

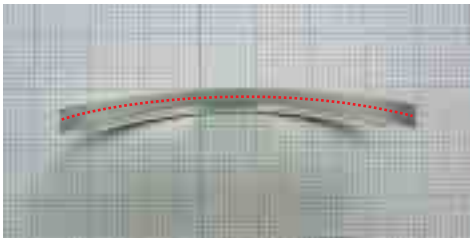
End mill	DLC-2MA ø6
Work material	GFRP
Revolution	8,000min^{-1}(151m/min)
Feed rate	2,000mm/min
Cutting method	Air blow

DLC-2MB Performance report (2)

Poly-carbonate

Comparison with (Al,Ti)N coated end mill,
Longer tool life without burrs.

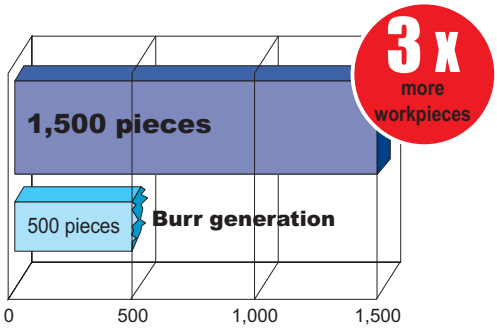




Machined area

DLC-2MB

Competitors (Al,Ti)N coated End Mill



Cutting conditions

End mill	DLC-2MB R0.3
Work material	Poly-carbonate
Revolution	12,000min^{-1}
Feed rate	900mm/min (0.03mm/tooth)
Depth of cut	ap 0.1mm
Coolant	Dry

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MITSUBISHI CARBIDE

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